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10/045,007	01/15/2002	Ilan Beer	BEER=4	2713

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EXAMINER

MITCHELL, JASON D

ART UNIT PAPER NUMBER

2193

DATE MAILED: 11/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/045,007	Applicant(s) BEER ET AL.	
	Examiner Jason Mitchell	Art Unit 2193	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 20 October 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-4, 6, 7, 9-16, 18, 20-28, 30, 31 and 33-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6, 7, 9-16, 18, 20-28, 30, 31 and 33-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

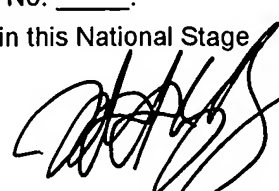
#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

  
TODD INGBERG  
JURY EXAMINER

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This action is in response to remarks filed 10/20/05.

At Applicant's request, claims 1, 13, 20 and 25 have been amended; claims 5, 7 and 29 have been canceled. Claims 1-4, 6-7, 9-16, 18, 20-28, 30-31 and 33-36 are pending in this application.

### ***Response to Arguments***

**Applicant's arguments on pp. 13-15 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.** However, upon further consideration, a new ground(s) of rejection is made in view of "Efficient Algorithms for Model Checking Pushdown Systems" by Esparza et al. In light of these new grounds of rejection **the finality of the previous action is withdrawn.**

### ***Claim Objections***

Applicant's amendments have corrected the problem with claim 20. The corresponding objection is withdrawn.

### ***Claim Rejections - 35 USC § 112***

**Claims 1, 3, 10, 13, 15, 22, 25 and 34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.** Claims 1, 13 and 25 recite a limitation 'the finite-state model is

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substantially independent of data values'. Use of the word 'substantially' makes it unclear exactly how 'independent of data values' the 'finite-state model' must be. Further 'substantially independent' would appear to conflict with the earlier stated limitation of 'eliminating the references'.

Claims 3, 20, 25, 22 and 34 are objected to for the same rationale.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1-3, 9-11, 13-15, 21-23, 25-27 and 33-35 rejected under 35**

**U.S.C. 102(b) as being anticipated by Efficient Algorithms for Model**

**Checking Pushdown Systems” by Esparza et al (Esparza).**

**Regarding Claims 1, 13 and 25:** Esparza discloses verifying software source code that includes references to program variables, the method comprising: processing the source code to derive a set of next-state functions representing control flow of the source code (pg. 12. par. 1 'represent the program by a system of flow graphs'); replacing the references to the program variables in the source code with non-deterministic choices in the next-state functions (pg. 12, par. 1 'interpreted non-deterministically since we abstract from the values of variables'); restricting the next-state functions including the non-deterministic choices to produce a finite-state model of the control flow (pg. 2, Sec. 1

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'configurations are finitely represented'); and verifying the finite-state model to find an error in the source code (pg. 3, Sec 3 'give model-checking algorithms') and replacing the program variables comprises eliminating the references to the program variables from the next-state functions, so that the finite-state model is substantially independent of data values of the program variables (pg. 12, par. 1 'interpreted non-deterministically since we abstract from the values of variables').

**Regarding Claims 2, 14 and 26:** The rejection of claims 1, 13 and 25 are incorporated respectively; further Esparza discloses that processing the source code comprises extracting a program counter from the source code (Fig. 5 note the individual states in the state diagram), and expressing the next-state functions in terms of the program counter (Fig. 5 note the pushdown system).

**Regarding Claims 3, 15 and 27:** The rejection of claims 2, 14 and 26 are incorporated respectively; further Esparza discloses that processing the source code further comprises expressing the next-state functions with reference to a stack pointer associated with a stack used in running the code (pg. 2, par. 4 'transition rules'), and wherein replacing the program variables comprises eliminating substantially all the references to the program variables from the next-state functions, leaving the next-state functions dependent on the program counter and on the stack pointer (pg. 12, par. 1 'interpreted non-deterministically since we abstract from the values of variables').

**Regarding Claims 9, 21 and 33:** The rejection of claim 1, 13 and 15 are incorporated respectively; further Esparza discloses verifying the finite-state

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model comprises checking the finite-state model against a specification using a model checker (pg. 10 Sec. 8 The Model-checking Problem).

**Regarding Claims 10, 22 and 34:** The rejection of claim 9, 21 and 33 are incorporated respectively; further Esparza discloses restricting the next-state functions comprises automatically producing the model from the source code in a form suitable for processing by the model checker, substantially without human intervention in deriving and restricting the next-state functions or in replacing the references (pg. 12, par. 1 'represent the program by a system of flow graphs ... we abstract from the values of variables').

**Regarding Claims 11, 23 and 35:** The rejection of claim 10, 22 and 34 are incorporated respectively; further Esparza discloses checking the finite state model comprises checking the model against one or more formulas expressed in terms of temporal logic (pg. 3, par. 4. 'Let Prop be a finite set of atomic propositions').

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 4, 6-7, 16, 18, 20, 28 and 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,481,717 to Esparza.**

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**Regarding Claims 4, 16, and 28:** The rejection of claims 3, 15 and 27 are incorporated respectively; further Esparza discloses limiting the stack pointer to a value no greater than a predetermined maximum (pg. 6, sec. 6 'each transition rule ... satisfies  $|w| \leq 2$ ') but only in an exemplary case.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to implement a product using the example scenario to simplify the algorithm (pg. 6, sec. 6 'be extended to the general case').

**Regarding Claims 6, and 30:** The rejection of claim 1, and 15 are incorporated respectively; further Esparza discloses processing the source code further comprises expressing the next-state functions with reference to a stack used in running the code (pg. 2, par. 4 'transition rules'), and wherein restricting the next-state functions comprises limiting the stack to a depth no greater than a predetermined maximum (pg. 6, sec. 6 each transition rule ... satisfies  $|w| \leq 2$ ').

**Regarding Claims 7, and 31:** The rejection of claims 6 and 30 are incorporated, respectively; further Esparza discloses expressing the next-state functions comprises expressing the next-state functions in terms of a stack pointer associated with the stack (pg. 2, par. 4 'transition rules'), and wherein limiting the stack comprises limiting the stack pointer to a value no greater than the predetermined maximum (pg. 6, sec. 6 'each transition rule ... satisfies  $|w| \leq 2$ ').

Further Esparza discloses expressing the next-state functions in terms of the stack pointer comprises incrementing the stack pointer in response to a function call in the source code, up to the predetermined maximum (pg. 6, sec. 6 'each

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transition rule ... satisfies  $|w| \leq 2'$ ), and decrementing the stack pointer when the function returns (pg. 2, par. 4 'transition rules').

**Regarding Claim 18:** The rejection of claim 13 is incorporated; further Esparza discloses processing the source code further comprises expressing the next-state functions with reference to a stack used in running the code (pg. 2, par. 4 'transition rules'), and wherein restricting the next-state functions comprises limiting the stack to a depth no greater than a predetermined maximum (pg. 6, sec. 6 'each transition rule ... satisfies  $|w| \leq 2'$ '). Further Esparza discloses expressing the next-state functions comprises expressing the next-state functions in terms of a stack pointer associated with the stack (pg. 2, par. 4 'transition rules'), and wherein limiting the stack comprises limiting the stack pointer to a value no greater than the predetermined maximum (pg. 6, sec. 6 'each transition rule ... satisfies  $|w| \leq 2'$ ').

**Regarding Claim 20:** The rejection of claim 18 is incorporated; further Esparza discloses expressing the next-state functions in terms of the stack pointer comprises incrementing the stack pointer in response to a function call in the source code, up to the predetermined maximum (pg. 6, sec. 6 'each transition rule ... satisfies  $|w| \leq 2'$ '), and decrementing the stack pointer when the function returns (pg. 2, par. 4 'transition rules').

**Claims 12, 24 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,481,717 to Esparza in view of applicants admission of prior art techniques.**



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**Regarding Claims 12, 24 and 36:** The rejection of claim 11, 23 and 35 are incorporated respectively; further Esparza does not explicitly disclose the use of counter-examples to indicate an error, but does inherently disclose displaying the result of the model comparison to a user (pg. 3 sec. 3 'compute the set of ... configurations that violate [a formula]').

Applicant indicates, in the background disclosure of the instant application, that providing a counter-example was a common method in the art at the time of the invention for providing this information (pg. 1, line 27-pg. 2, line 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to display a counter-example, as taught by Applicant (pg. 1, line 27-pg. 2, line 1), to the user as disclosed in Esparza (pg. 3 sec. 3 'compute the set of ... configurations that violate [a formula]') in order to provide a user a method of 'understanding and remedying the design defect as noted in the instant application (pg. 2, lines 1-2).

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason Mitchell whose telephone number is (571) 272-3728. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30-5:00.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on (571) 272-3719. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jason Mitchell  
11/23/05



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